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1 Dispensing Apparatus and Method

2

3 This invention relates to a dispensing apparatus and
4 method, and particularly, but not exclusively, to a
5 dispensing apparatus and method for dispensing
6 flowable dentifrice materials onto a toothbrush
7 head.

8

9 Conventionally, the task of cleaning teeth with a
10 flowable dentifrice material such as a paste or gel
11 involves the manual squeezing of a deformable tube
12 to deposit the material onto a toothbrush.

13 Alternatively, rigid tubes having a manually
14 operated pump mechanism for dispensing the
15 dentifrice material are also widely available.

16

17 Other known dispensers employ lever and ratchet
18 mechanisms, cantilever arm devices or operate
19 utilising the force of gravity and a winder key
20 dispensing device.

21

1 Whilst such devices have provided an improved
2 dispensing means for dentifrice material for the
3 majority of people, others may find such devices
4 cumbersome or awkward to use. For example, young
5 children may have a tendency to over-squeeze a
6 toothpaste tube and have difficulty in accurately
7 directing the discharged dentifrice material onto
8 the toothbrush. The elderly, the infirm and people
9 suffering from arthritic or related inflammatory
10 complaints may also find the task of manually
11 dispensing a dentifrice material onto a toothbrush
12 rather onerous and/or painful.

13
14 A further disadvantage of known dispensers, for
15 dentifrice and other flowable materials, is that it
16 is often difficult to empty their contents
17 completely. Consequently, a significant amount of
18 wastage is typical. Moreover, known dispensers do
19 not expel dentifrice material in a clean fashion as
20 it tends to accumulate around their openings.

21
22 According to a first aspect of the present invention
23 there is provided a dispensing apparatus comprising
24 an inlet port for coupling to an opening of a
25 container containing flowable material and an outlet
26 port through which the material is dispensed; the
27 inlet and outlet ports being separated by a conduit;
28 a first one-way valve positioned at the inlet port
29 to permit passage of the flowable material from the
30 container into the conduit, and a second one-way
31 valve positioned at the outlet port to permit
32 passage of the flowable material from the conduit;
33 and means for selectively varying the volume of the

1 conduit between the inlet and outlet ports to pump
2 the flowable material.

3
4 Preferably, the conduit is resiliently deformable.

5
6 Preferably, the respective inlet and outlet ends of
7 the conduit are displaceable relative to each other
8 to selectively vary the volume of the conduit
9 between the inlet and outlet ports.

10
11 Preferably, the inlet port is adapted to form a
12 hermetically sealed connection with the opening of
13 the container.

14
15 Preferably, a collar for receiving the opening of
16 the container and forming a hermetic seal is mounted
17 on, and surrounds, the inlet port.

18
19 Preferably, the collar is resiliently deformable.

20
21 Preferably, the collar is annular in shape and has a
22 substantially planar upper end surface, a
23 substantially planar lower end surface and
24 substantially cylindrical internal and external
25 surfaces.

26
27 Preferably, at least part of the internal surface of
28 the resilient collar tapers inwardly from the upper
29 end surface around its entire circumference to form
30 a frusto-conical profile.

31
32 Optionally, at least one upstanding annular sealing
33 ring extends from the upper end surface.

1
2 Preferably, the or each upstanding annular sealing
3 ring is formed integrally with the resilient collar.

4
5 Preferably, the resilient collar is made from a
6 silicone material.

7
8 Preferably, a substantially rigid housing surrounds
9 the collar and the inlet port.

10
11 Preferably, a radial flange portion projects
12 inwardly from the lower peripheral edge of the
13 housing.

14
15 Preferably, the inlet end of the conduit proximate
16 the inlet port is supported on the radial flange.

17
18 Preferably, the inlet port is interposed between the
19 conduit and the collar.

20
21 Preferably, projections are provided on the exterior
22 of the housing, said projections being releasably
23 connectable to a wall-mountable casing such that the
24 dispensing apparatus and the container are locatable
25 within said casing.

26
27 Preferably, a cradle member is pivotably and
28 releasably mounted on the casing.

29
30 Preferably, cam surfaces are provided on the cradle
31 member.

32
33 Preferably, cam surface engaging portions are

1 provided on the outlet port.

2

3 Preferably, the cam surface engaging portions are
4 diametrically opposed projecting pins.

5

6 Preferably, the cradle member has two sidewalls and
7 a supporting surface adapted to receive a toothbrush
8 head.

9

10 Preferably, the supporting surface is provided with
11 a push surface for selective engagement with the
12 distal end of the toothbrush head.

13

14 Preferably, the flowable material is semi-solid.

15

16 Preferably, the flowable semi-solid material is
17 dentifrice material.

18

19 Optionally, the conduit is a bellows pump.

20

21 Preferably, the inlet port is perforated.

22

23 Preferably, the first one-way valve is an umbrella
24 valve.

25

26 Preferably, the second one-way valve is a duckbill
27 valve.

28

29 According to a second aspect of the present
30 invention there is provided a method of dispensing
31 flowable material from a container using the
32 dispensing apparatus of the first aspect comprising
33 the steps of:

1 (i) coupling the opening of a container with an
2 inlet port of the dispensing apparatus;
3 (ii) priming the dispensing apparatus to remove
4 any air within the apparatus or the container
5 by sequentially reducing and increasing the
6 volume between the inlet port and an outlet
7 port in a pumping action; and
8 (iii) reducing the volume between the inlet and
9 outlet ports to pump the dentifrice material
10 from the container and through a first one-way
11 valve, a conduit and a second one-way valve
12 respectively.

13
14 Preferably, the step of reducing the volume between
15 the inlet and outlet ports is achieved by applying a
16 force to compress the conduit longitudinally.

17
18 Preferably, the step of applying a longitudinal
19 force is achieved by pivoting a cradle member having
20 cam surfaces about a pivot axis, said cam surfaces
21 moving cam surface engaging portions provided on the
22 outlet port, thus moving the outlet port towards the
23 inlet port.

24
25 Preferably, the step of pivoting the cradle member
26 is achieved by placing a toothbrush head on the
27 cradle member and applying a force in a direction
28 corresponding to the longitudinal axis of the
29 toothbrush.

30
31 Embodiments of the present invention will now be
32 described, by way of example only, with reference to
33 the accompanying drawings, in which:

1
2 Fig. 1 is a cross-sectional perspective view of
3 the collar and conduit portions of the
4 dispensing apparatus;
5
6 Fig. 2 is a perspective view of the dispensing
7 apparatus of Fig. 1 and a cradle member, each
8 located within a wall mountable casing;
9
10 Fig. 3 shows both a cross-sectional and plan
11 view of an alternative collar;
12
13 Figs. 4a and 4b are side and cross-sectional
14 side views respectively of dispensing apparatus
15 including the collar of Fig. 1 and show valves
16 and an alternative conduit;
17
18 Figs. 5a-c are cross-sectional schematic views
19 showing the conduit and valves of the
20 dispensing apparatus at various stages during
21 its operation; and
22
23 Figs. 6a-c are a cross-sectional side view, a
24 front view and a perspective view respectively
25 of the complete dispensing apparatus within its
26 wall mountable casing.
27
28 Fig. 1 shows a dispensing apparatus sub-assembly
29 comprising an inlet port 10 and an outlet port 12
30 separated by a resiliently deformable conduit in the
31 form of a bellows pump 14. An upstanding
32 resiliently deformable collar 16 made from elastic
33 silicone material is mounted on and surrounds the

1 inlet port 10.

2

3 The collar 16 is annular in shape and has
4 substantially planar upper and lower end surfaces
5 16a and 16b, and substantially cylindrical internal
6 16c and external surfaces respectively. The
7 transition surface 16d between the first end surface
8 16a and the internal surface 16c tapers inwardly
9 around the circumference of the collar 16 to form a
10 frusto-conical profile.

11

12 A substantially rigid housing 18 surrounds the
13 resilient collar 16 and is provided with an inwardly
14 projecting annular flange 20 around the periphery of
15 its lower edge. The end of the bellows pump 14
16 proximate the inlet port 10 is supported on the
17 flange 20 within the housing 18 and the inlet port
18 10 is held interposed between the end of the bellows
19 pump 14 and the lower end surface 16b of the
20 resilient collar 16. The resilient collar 16, the
21 inlet port 10 and the end of the bellows pump 14 are
22 fixed firmly at their respective joins by any
23 suitable means for producing a hermetic seal, for
24 example, by gluing or hot melt sealing.

25

26 Fig. 3 shows a modified collar 16 having a pair of
27 upstanding annular sealing rings extending from its
28 upper end surface 16a. The sealing rings are formed
29 integrally with the collar 16 and extend
30 concentrically around the full circumference of its
31 upper end surface 16a. The height of the inner
32 sealing ring is less than the height of the outer
33 sealing ring.

1
2 In addition, the modified collar 16 of Fig. 3 is
3 provided with a stepped internal surface with three
4 different internal diameters. The diameter of the
5 cylindrical internal surface proximate the upper end
6 surface 16a is reduced as compared to that of the
7 central recessed portion of the collar 16. Finally,
8 the diameter of the cylindrical internal surface
9 proximate the lower end surface 16b is yet greater
10 again.

11
12 As will become apparent, the presence of: (i) the
13 pair of upstanding annular sealing rings; and (ii)
14 the reduced diameter portion of the internal surface
15 proximate the upper end surface 16a, each act to
16 minimise the possibility of air being sucked into
17 the dispensing apparatus between the collar 16 and a
18 container received therein.

19
20 Figs. 4a and 4b show a further alternative
21 embodiment of the dispensing apparatus sub-assembly
22 wherein the conduit 14 has generally cylindrical
23 sidewalls as opposed to concertina shaped walls.
24 The lower portion (proximate the outlet valve 24) of
25 the walls of the conduit 14 shown in Fig. 4b are
26 thicker than those of the upper portion of the
27 conduit 14. The thicker walls of the lower portion
28 cause the internal diameter of the conduit 14 to be
29 reduced proximate the outlet valve 24.

30
31 Perforations 21 are provided in the inlet port 10
32 and an umbrella valve 22 selectively opens and
33 closes to allow material to pass through the

1 perforations 21 into the bellows pump 14. The
2 umbrella valve 22 fits within a recessed portion 17
3 formed at the lower edge of the internal surface 16c
4 of the collar 16. A duckbill valve 24 positioned
5 within the outlet port 12 selectively opens and
6 closes to allow flowable material to pass through
7 and exit the bellows pump 14.

8
9 The selection of appropriate one-way valves at the
10 inlet and outlet ports 10, 12 is important for
11 effective operation of the dispensing apparatus.
12 For example, the configuration of the umbrella valve
13 22 is such that it is appropriate for the suction of
14 material into the conduit 14 whilst its profile is
15 such that the valve itself does not substantially
16 extend vertically into the conduit 14 (for example,
17 see Fig. 5c). The duckbill valve 24 is particularly
18 suitable for use at the outlet port 12 because it
19 provides a directed and even flow of material with a
20 clean cut-off thus eliminating or reducing any messy
21 accumulation of dentifrice material thereon.

22
23 As shown in Fig. 2, the sub-assembly of Fig. 1 is
24 located within a wall mountable casing 26, which is
25 fixable onto, say, a bathroom wall 28. Projections
26 30 are provided on the exterior surface of the
27 housing 18 and releasably receivable within
28 corresponding grooves 32 on sidewalls of the casing
29 26. It will be appreciated that this arrangement
30 facilitates removal of the sub-assembly from the
31 casing for cleaning or replacement of parts.

32

1 A cradle member 34 is releasably and pivotably
2 mounted on the casing 26 by means of protrusions 36
3 formed on its sidewalls 38, which locate in
4 corresponding apertures in the casing 26. The
5 cradle member 34 has cam surfaces 40 formed on the
6 periphery of each sidewall 38, which engage with
7 diametrically opposed outwardly projecting pins 42
8 on the outlet port 12. The cradle member 34 is
9 provided with a substantially horizontal supporting
10 surface 46, which joins the lower edges of the
11 sidewalls 38 of the cradle member 34. The
12 supporting surface 46 is provided with a push
13 surface 48 for cooperation with the distal end of a
14 toothbrush head 44, as described below.

15
16 As shown in Figs. 6a-c, for aesthetic purposes, the
17 sub-assembly, cradle member 34 and casing 26
18 described above are covered by a cover member 50.
19 The cover member 50 is substantially tubular in
20 shape and may be formed from any suitable material,
21 for example, plastics, ceramics, coated metals etc.
22 The bottom end of the cover member 50 is open-ended
23 to enable the cover member 50 to slide over the
24 assembled apparatus described above. The top end of
25 the cover member is closed. A slit (not shown) may
26 be provided in the cover member 50 to enable it to
27 slide over wall-fixings 52 connecting the casing 26
28 to a wall. An opening 54 is provided at the lower
29 end of the casing and is positioned to correspond
30 with the supporting surface 46 of the cradle member
31 34.

32

1 In use, the opening of a container is located within
2 the resilient collar 16 and the elastic nature of
3 the silicone material forms a hermetic seal. The
4 frusto-conical portion 16d of the collar 16
5 facilitates coupling of the opening of the container
6 with the inlet port 10. Optionally, the modified
7 collar of Fig. 3 may be employed to assist in
8 providing the hermetic seal.

9
10 The following description uses the example of
11 dispensing dentifrice material (i.e. a semi-solid
12 flowable material) from a deformable toothpaste
13 tube. It should be appreciated however that the
14 invention may be used to dispense any other flowable
15 material, nor is its operation limited for use with
16 only deformable containers.

17
18 In order to dispense dentifrice material from the
19 dispensing apparatus, the dispensing apparatus must
20 first be primed to remove any air from within the
21 conduit 14 and the toothpaste container. This is
22 achieved by positioning the toothbrush head 44 on
23 the supporting surface 46 of the cradle member 34
24 and applying a force in a direction corresponding to
25 the longitudinal axis of the toothbrush. Such a
26 force causes the toothbrush head 44 to push against
27 the push surface 48 and pivot the cradle member 34
28 relative to the casing 26 about its protrusions 36.

29
30 The pivoting action of the cradle member 34 causes
31 the projecting pins 42 on the outlet port 12 to
32 slide up the cam surfaces 40 on the cradle member
33 34. The pivoting of the cradle member 34 therefore

1 causes the outlet port 12 to be forced upwardly
2 towards the inlet port 10. During this upward
3 motion, the bellows pump 14 is compressed
4 longitudinally and progressively collapses to
5 thereby reduce the volume between the inlet and
6 outlet ports 10, 12 and expel air from the bellows
7 pump 14 and the toothpaste container via the
8 duckbill valve 24.

9
10 Upon withdrawal of the toothbrush head 44 from the
11 push surface 48, the cradle member 34 returns to its
12 initial position by virtue of the resilient nature
13 of the bellows pump 14. It may be necessary to
14 repeat this sequence several times to ensure that
15 substantially all air is expelled from the bellows
16 pump 14 and the toothpaste container.

17
18 Once fully primed, any air in the bellows pump 14
19 will be replaced with dentifrice material as
20 indicated in Fig. 5a and the dispensing apparatus is
21 ready for use. Further pivotal movement of the
22 cradle member 34 as described above will cause
23 dentifrice material to be forced from the bellows
24 pump 14 onto the underlying toothbrush head 44 as
25 indicated in Fig. 5b. The pivot point 36 of the
26 cradle member 34 is positioned forward of the
27 duckbill valve 24 and consequently the toothbrush
28 travels upwards during the pivoting motion. Such a
29 motion causes the toothbrush head to 'follow' the
30 duckbill valve upwards and aids accurate placement
31 of the dentifrice material onto the toothbrush head
32 44.

33

1 It will be appreciated that the alternative conduit
2 shown in Figs. 4a and 4b will operate in a similar
3 fashion to the bellows pump described above. As
4 shown in Fig. 4b, the region where the wall of
5 increased thickness meets the wall of lesser
6 thickness will deform as the upward force is
7 applied. It will also be appreciated that the
8 narrowing of the internal diameter proximate the
9 outlet valve 24 in Fig. 4b, and hence the reduced
10 volume of the conduit at this region, will cause a
11 higher pressure to be imparted to the dentifrice
12 material as it is expelled from the valve 24.

13

14 Upon removal of the toothbrush head 44 from the
15 cradle member 34, the resilient nature of the
16 bellows pump 14 returns the apparatus to its
17 original position. As illustrated in Fig. 5c,
18 during the return motion, further dentifrice
19 material is drawn into the bellows pump 14 through
20 the open umbrella valve 22 due to the pressure
21 differential between the inside of the toothpaste
22 container and the inside of the bellows pump.

23

24 The push stop 48 on the cradle member 34 is also
25 positioned forward of the duckbill valve 24 such
26 that the dentifrice material is deposited along the
27 length of the toothbrush head 44 from its distal end
28 to its handle end. The maximum distance through
29 which the toothbrush head 44 can pivot therefore
30 corresponds to the length of a standard toothbrush
31 head. Accordingly, the amount of dentifrice
32 material dispensed from the duckbill valve 24 onto
33 the toothbrush head 44 may be dictated by the degree

1 to which the cradle member 34 is pivoted and/or the
2 incline of the contours of the cam surfaces 40.
3
4 It will be appreciated that the dispensing apparatus
5 of the present invention can be easily disassembled
6 for cleaning purposes or for replacement of parts.
7 For example, the cradle member 34 may be
8 disconnected from the casing 26 by manually pinching
9 the sidewalls 38 toward each other thereby moving
10 the protrusions 36 out of engagement from their
11 corresponding apertures. Similarly, the rigid
12 housing 18 can be removed from the casing 26 by
13 sliding its projections 30 out of engagement with
14 the corresponding grooves 32 formed in the sidewall
15 of the casing 26.
16
17 It will also be appreciated by those skilled in the
18 art that the apparatus of the present invention can
19 be operated by only one hand and therefore provides
20 a simple, effective and convenient means of
21 dispensing dentifrice material onto a toothbrush.
22 The features of the invention are particularly
23 advantageous for children, the disabled or the
24 elderly who may find conventional means of
25 dispensing dentifrice material onto a toothbrush
26 difficult to operate.
27
28 Modifications and improvements may be made to the
29 above without departing from the scope of the
30 present invention. For example, the dispenser need
31 not be used exclusively for dentifrice material and
32 could equally be adapted to dispense a variety of
33 different semi-solids or fluids, for example,

1 creams, hand-wash, mousse, shaving gel, hair gel,
2 washing up liquid and the like.

3

4 The conduit need not be in the form of a bellows
5 pump and the volume varying means may act in a
6 transverse rather than a longitudinal direction.

7 The cradle member may be adapted to correspond with
8 the material being dispensed. For example, if
9 material were intended to be dispensed onto a hand
10 (i.e. soap or shaving foam) then an appropriately
11 shaped cradle member would be employed.

12

13 Alternative one-way valves could be used at either
14 end of the conduit and the collar could include a
15 threaded aperture to receive a correspondingly
16 threaded neck of a container.

17

18 The upstanding annular rings described above with
19 reference to Fig. 3 could equally be incorporated
20 into the other embodiments described with reference
21 to Figs. 1 and 4b.

22

23 Whilst the dispensing apparatus of the present
24 invention has been described as being fixed on a
25 wall in a vertical orientation, it could equally be
26 adapted to operate in other orientations.